D-1585

PATENT SPECIFICATION (11) 1 335 807

DRAWINGS ATTACHED

1 335 807

(21) Application No. 14949/72 (22) Filed 30 March 1972

(44) Complete Specification published 31 Oct. 1973

(51) International Classification A62B 35/02

(52) Index at acceptance
A3V 9F1A1 9F1D4A 9F2C2 9F2E2 9F2H2

(72) Inventor DAVID EDWARD HUGHES

(54) ENERGY ABSORBING REEL FOR A MOTOR VEHICLE SEAT BELT ASSEMBLY

(71) We, FORD MOTOR COMPANY LIMITED, of 88 Regent Street, London, W.1, a British Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a reel for a motor vehicle seat belt assembly. Such reels usually comprise a spring-loaded spindle arranged to wind-up a length of seat belt webbing either for storage purposes when the seat belt is not in use or to keep the belt properly tightened against the wearer when the seat belt is in use.

A locking means is connected between the spindle and the housing of the reel. In the type of reel commonly known as an 'inertia reel' the locking means locks the spindle to the housing in response to sudden extension of the webbing from the reel or to sudden deceleration of the vehicle to which it is fitted. In the 'retractor' type of reel the locking means permits initial extension of the webbing when the belt is first put on and thereafter allows the spindle to gather the webbing and tighten the belt about the wearer but prevents any extension of the webbing.

Both types of mechanism lock the spindle relative to the housing and in a severe collision the wearer of the seat belt is abruptly restrained. The performance of seat belts can be measured in terms of a Severity Index which depends upon the acceleration of the head of a dummy wearing the seat belt under test conditions. Both types of reel currently in use lock the spindle relative to the housing and the abrupt restraint of the wearer of the seat belt caused by such reel locking results in a high Severity Index.

According to the invention a reel for a motor vehicle seat belt assembly has the following features:—

(a) a spring-loaded spindle mounted in a housing is adapted, in use, to wind-up a seat belt webbing;

(b) the spindle is connected to the housing by a locking means and a deformable member;

(c) when the locking means is engaged the deformable member prevents rotation of the spindle relative to the housing unless, in use, the load in the webbing exceeds a predetermined value;

(d) when the load exceeds said predetermined value the deformable member is deformed with absorption of energy as the spindle is rotated by the webbing; and

(e) the deformable member is a length of metal connected at one end to a hub, the length of metal being drawn over an abutment and wound onto the hub as the spindle turns when the webbing load exceeds the predetermined value.

The invention may be applied either to the 'inertia' or 'retractor' type of reel. In both cases the locking means is operable to connect the deformable member between the spindle and the housing so that the deformable member is deformed when the torque load on the spindle exceeds a certain value. The deformable member is designed to deform in a manner to maintain a substantially uniform load on the belt during deformation so that the load applied to the seat belt webbing by the reel is held below the design value as the webbing extends from the reel and in operation the wearer is decelerated less abruptly than would have been the case if movement of the spindle after actuation of the locking means had not been permitted.

The invention will now be described with reference to the accompanying drawings, in which:—

Figure 1 is an axial section of a seat belt inertia reel embodying the invention; and

Figure 2 is a section along the line A—A of Figure 1 showing the deformable member.

An energy absorbing inertia reel for a motor

[Price 25p]

vehicle seat belt assembly comprises a housing 10, a spindle 11 mounted for rotation in the housing 10 and a spiral coil spring 12 connected between the spindle and the housing for winding the seat belt webbing 13 on to the spindle 11. A locking means 14 sensitive to acceleration of the webbing as it is extended from the reel connects one end of the spindle 11 to a hub 15 mounted for rotation about the same axis as the spindle. The locking means may comprise a helically screw-threaded member 16 rotationally fast with the spindle 11 carrying an inertia member 17. In operation inertia member 17 lags the rotational movement of the helical thread on member 16 and is moved axially into engagement with a clutch 18 thereby locking the spindle to the hub 15.

Referring now to Figure 2 a deformable member comprises a strip of metal 19 having its outer section wound in a spiral coil and connected at its inner end to the hub 15. Between the spiral coil section and the hub 15 the strip 19 passes between abutments 20 and 21 fixed relatively to the housing 10. The spiral coil section of the strip 19 starting at its inner end is wound in the opposite direction to the angular direction in which the spindle moves when the webbing is extended from the reel.

In operation the spindle is normally free to wind up the webbing or to permit extension of the webbing as required by the seat belt wearer. Upon sudden acceleration of the seat belt wearer as occurs in a collision involving the vehicle the locking means connects the spindle 11 to the hub 15 thereby preventing extension of the webbing from the reel unless the load in the webbing exceeds a predetermined value sufficient to deform the metal strip 19. When the load in the seat belt webbing exceeds this predetermined value the hub 15 begins to turn and the metal strip 19 is deformed over the abutment 20 and wound on to the hub 15 in the opposite angular sense to the direction of winding of the spiral coil section absorbing energy as it does so. The reel thus decelerates the seat belt wearer relatively to the vehicle less abruptly than would be the case if the spindle was locked directly to the reel housing 10.

It will be appreciated that the inertia type locking means may be replaced by a retractor type of locking means.

In the embodiment described above the locking means is connected between the spindle and the energy absorbing metal strip and the metal strip is connected between the locking means and the housing. Alternatively the metal strip may connect the spindle to the locking means and the locking means may connect the metal strip to the housing.

WHAT WE CLAIM IS:—

1. A reel for a motor vehicle seat belt assembly in which:—

(a) a spring loaded spindle mounted in a housing is adapted, in use, to wind-up a seat belt webbing;

(b) the spindle is connected to the housing by a locking means and a deformable member;

(c) when the locking means is engaged the deformable member prevents rotation of the spindle relative to the housing unless, in use, the load in the webbing exceeds a predetermined value;

(d) when the load exceeds said predetermined value the deformable member is deformed with absorption of energy as the spindle is rotated by the webbing; and

(e) the deformable member is a length of metal connected at one end to a hub, the length of metal being drawn over an abutment and wound onto the hub as the spindle turns when the webbing load exceeds the predetermined value.

2. A reel as claimed in Claim 1 in which the locking means is of the inertia type having an inertia member which lags rotation of the spindle and the locking means is adapted to operate when the webbing is suddenly withdrawn from the reel.

3. A reel as claimed in Claim 1 in which the locking means is of the retractor type and is adapted to be operated by extension of the webbing from the reel.

4. A reel as claimed in Claim 3 in which the hub is coaxial with the spindle and is connected to the spindle when the locking means is engaged.

5. A reel as claimed in Claim 4 in which the abutment is fixed relative to the housing.

6. A reel as claimed in any one of the preceding Claims in which the length of metal is a strip wound into a spiral coil within the housing, the strip being wound onto the hub in the opposite angular sense after passing over the abutment.

7. A reel for a motor vehicle seat belt assembly substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

PETER ORTON,
Chartered Patent Agent.

Printed for Her Majesty's Stationery Office by Burgess & Son (Abingdon), Ltd.—1973.
Published at The Patent Office, 25 Southampton Buildings, London, WC2A 1AY,
from which copies may be obtained.

vehicle seat belt assembly comprises a housing 10, a spindle 11 mounted for rotation in the housing 10 and a spiral coil spring 12 connected between the spindle and the housing for winding the seat belt webbing 13 on to the spindle 11. A locking means 14 sensitive to acceleration of the webbing as it is extended from the reel connects one end of the spindle 11 to a hub 15 mounted for rotation about the same axis as the spindle. The locking means may comprise a helically screw-threaded member 16 rotationally fast with the spindle 11 carrying an inertia member 17. In operation inertia member 17 lags the rotational movement of the helical thread on member 16 and is moved axially into engagement with a clutch 18 thereby locking the spindle to the hub 15.

Referring now to Figure 2 a deformable member comprises a strip of metal 19 having its outer section wound in a spiral coil and connected at its inner end to the hub 15. Between the spiral coil section and the hub 15 the strip 19 passes between abutments 20 and 21 fixed relatively to the housing 10. The spiral coil section of the strip 19 starting at its inner end is wound in the opposite direction to the angular direction in which the spindle moves when the webbing is extended from the reel.

In operation the spindle is normally free to wind up the webbing or to permit extension of the webbing as required by the seat belt wearer. Upon sudden acceleration of the seat belt wearer as occurs in a collision involving the vehicle the locking means connects the spindle 11 to the hub 15 thereby preventing extension of the webbing from the reel unless the load in the webbing exceeds a predetermined value sufficient to deform the metal strip 19. When the load in the seat belt webbing exceeds this predetermined value the hub 15 begins to turn and the metal strip 19 is deformed over the abutment 20 and wound on to the hub 15 in the opposite angular sense to the direction of winding of the spiral coil section absorbing energy as it does so. The reel thus decelerates the seat belt wearer relatively to the vehicle less abruptly than would be the case if the spindle was locked directly to the reel housing 10.

It will be appreciated that the inertia type locking means may be replaced by a retractor type of locking means.

In the embodiment described above the locking means is connected between the spindle and the energy absorbing metal strip and the metal strip is connected between the locking means and the housing. Alternatively the metal strip may connect the spindle to the locking means and the locking means may connect the metal strip to the housing.

WHAT WE CLAIM IS:—

1. A reel for a motor vehicle seat belt assembly in which:—

(a) a spring loaded spindle mounted in a housing is adapted, in use, to wind-up a seat belt webbing;

(b) the spindle is connected to the housing by a locking means and a deformable member;

(c) when the locking means is engaged the deformable member prevents rotation of the spindle relative to the housing unless, in use, the load in the webbing exceeds a predetermined value;

(d) when the load exceeds said predetermined value the deformable member is deformed with absorption of energy as the spindle is rotated by the webbing; and

(e) the deformable member is a length of metal connected at one end to a hub, the length of metal being drawn over an abutment and wound onto the hub as the spindle turns when the webbing load exceeds the predetermined value.

2. A reel as claimed in Claim 1 in which the locking means is of the inertia type having an inertia member which lags rotation of the spindle and the locking means is adapted to operate when the webbing is suddenly withdrawn from the reel.

3. A reel as claimed in Claim 1 in which the locking means is of the retractor type and is adapted to be operated by extension of the webbing from the reel.

4. A reel as claimed in Claim 3 in which the hub is coaxial with the spindle and is connected to the spindle when the locking means is engaged.

5. A reel as claimed in Claim 4 in which the abutment is fixed relative to the housing.

6. A reel as claimed in any one of the preceding Claims in which the length of metal is a strip wound into a spiral coil within the housing, the strip being wound onto the hub in the opposite angular sense after passing over the abutment.

7. A reel for a motor vehicle seat belt assembly substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

PETER ORTON,
Chartered Patent Agent.

Printed for Her Majesty's Stationery Office by Burgess & Son (Abingdon), Ltd.—1973.
Published at The Patent Office, 25 Southampton Buildings, London, WC2A 1AY,
from which copies may be obtained.

1335807 COMPLETE SPECIFICATION
2 SHEETS This drawing is a reproduction of the Original on a reduced scale
Sheet 1

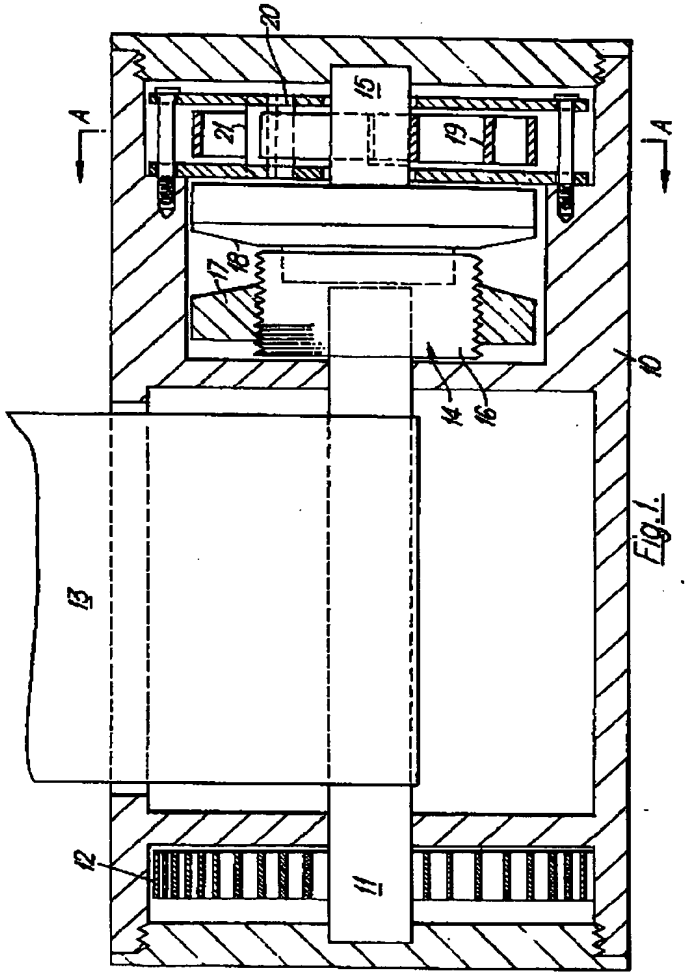

Fig.1.

1335807 COMPLETE SPECIFICATION
2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 2

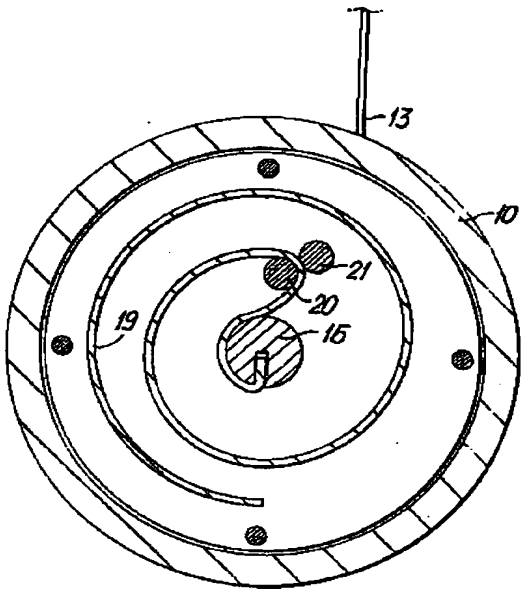

Fig.2.